Islamic University of Gaza
Water Resources Management
EENV3352
First Semester (2012-2013)
Allowable time 80 minutes

Instructors:
Dr. Yunes Mogheir
Dr. Said Ghabayen
Eng. Manar El.Swaity
Eng. Taher Abu neama

CLOSED BOOK EXAM

Student Name: ____________________

Q1	7.5	**7.5**
Q2	3	**4.5**
Q3	4	**4**
Q4	6	**6**
Q5	6	**8**
Total	26.5	**30**

Question 1 **(7.5 Marks)** 7.5

State whether the following statements are True or False

1. (✓) In the global level, the quantity of groundwater is much more than the quantity of surface water in the rivers and lakes.
2. (X) Porosity in fine grained soil is less than the porosity in coarse grained soil.
3. (✓) Specific retention in clay is more than the specific retention in sand.
4. (✓) Uniform material has low uniformity coefficient.
5. (✓) Saturated capillary zone is located in the zone of aeration
6. (X) Limestone aquifer is considered to be inter-granular type of aquifer.
7. (✓) Actual velocity in the pore space is usually larger than the Darcy flux.
8. (X) the hydraulic conductivity value is independent to fluid density or viscosity.
9. (X) Anisotropic aquifer implies that the hydraulic conductivity is different from one location to another.
10. (✓) Under Dupuit conditions, the water table has a parabolic shape surface.

m^3 10 * 9.686 ÷ mass / density = 0.09686 / 1000 ← (*)

Question 2 (4.5 Marks)

An undisturbed soil sample has an oven dry weight of 825.61g. After saturation with water its weight is 922.47g. The saturated sample is then immersed in water and displaces 331.59g what is the porosity of soil sample.

∴ $W_{dry\ of\ Soil} = 825.61$ gram

$W_{total} = W_{sat(+water)} = 922.47$ ∴ $W_{of\ water} = 922.47 - 825.61 = 96.86$ gram

$S_y = 331.59g$

$\alpha = \frac{V_T - V_s}{V_T} = 1 - \frac{\rho_d}{\rho_m} =$

∴ $\rho = \frac{m}{V}$

$= 0.331\ (kg) * 9.81\ m/sec$

Question 3 (4.5 Marks) 4

How much water per dunum must be removed from an unconfined aquifer with specific yield of 0.2 in order to lower the water table 1m. Assume that the porosity does not change.

∴ $S_y = \frac{V_y}{V_t\ (A \times \Delta H)}$ ⇒ ∴ $V_y = S_y * (1000\ m^2 * 1m)$

$= 200\ m^3$

(*)

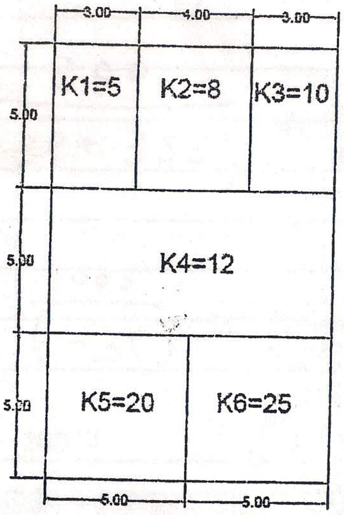
$3.25 * 10^{-3} =$

$0.0298 = \frac{9.686 * 10^{-5}}{3.25 * 10^{-3}} = \alpha = \frac{V_v}{V_T} =$

∴ $\alpha = 0.0278$

Question 4 : **(6Marks)** 6

Consider a soil sample formation shown in the figure which has different layers (distributed horizontally and vertically) with their own hydraulic conductivity K1 to K6 are 5, 8, 10, 12, 20, and 25 m/day, respectively. Calculate Kx and Kz for this formation.



Kz= 7.14

12

22.22

7.7

19

22.5

c) water divid (not exist) ∴ the flow from high head to low head (i.e; from B → A) ✗

$$\therefore q_{A\to B} = -Ki\left(\frac{10+8}{2}\right) = \frac{K}{2x}(100-64) = 0.36\ m^3/day.m$$ ✗

Question 5: (8 Marks) 6 −2

An unconfined aquifer is located between two fully penetrating rivers and has K = 10 m/day, α = 0.3 and recharge w = 1825 mm/year. The water surface elevations above the bottom in rivers A and B are 8 and 10 respectively.

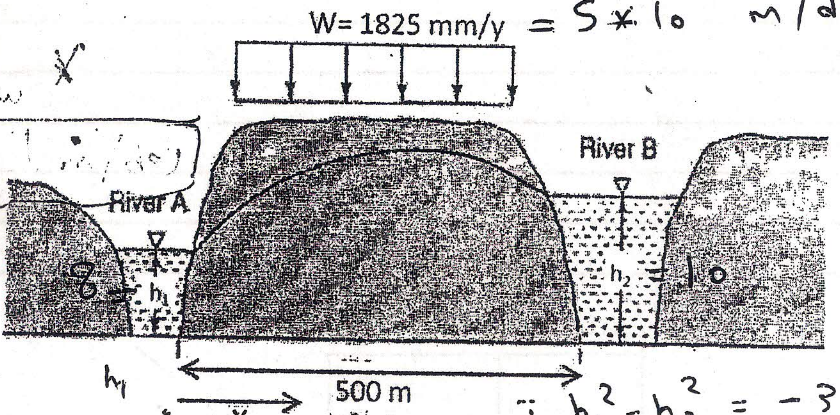
a) What is the maximum elevation of water table and where is it located.

b) What will be the travel time of the groundwater in the aquifer from the groundwater divide to river A.

c) To what value the recharge should reduce to make the groundwater divide not exist within the aquifer.

$K = 10\ m/day$

$= 5 \times 10^{-3}\ m/day$



$\therefore h_1^2 - h_2^2 = -36$

① $\therefore d = 250 - \frac{10}{5\times10^{-3}}\frac{(-36)}{1000} = 322\ m$ (from A) ✓

$$h^2 = 64 - \frac{(-36 \times 322)}{500} + \frac{5\times10^{-3}}{10}(178)\ 322$$

$= 115.844$ $\therefore h_{max} = 10.76\ m$ ✓

$\Delta H = 10.76 - 8 = 2.76$

② $\therefore V = -Ki = -(10)\left(\frac{-2.76}{322}\right) = 0.085\ m/day$ ✓

$\frac{V}{\alpha} = V_a = 0.285\ m/day$ ($\alpha = 0.3$)

$\Rightarrow \therefore T = \frac{L}{V_a} = \frac{322}{0.285} = 1127\ day = 3.08\ year$